Brief

Assessment of MoDOT'S Transportation Management Systems - Part II

The opinions, findings, and conclusions expressed in this publication are those of the principal investigators and the Missouri Department of Transportation; Research, Development and Technology. They are not necessarily those of the U.S. Department of Transportation, Federal Highway Administration. This report does not constitute a standard or regulation.

Research Development and Technology

Missouri Department of Transportation

1617 Missouri Blvd.
P.O. Box 270
Jefferson City,
Missouri 65101

Introduction

MoDOT's Transportation Management System (TMS) has required a significant investment in time and resources over the past 10 years. TMS was designed to collect, organize and process data into information that could then be used to support many of the decisions made within MoDOT. It was envisioned that once implemented TMS would increase operational efficiency by 10-15% and improve the use of transportation resources by 1-5%. However, the attainment of this vision has been hindered by the fact that TMS is often both misunderstood and underutilized. The MoDOT TMS is based on an excellent foundation and an excellent support team has been established. In order to determine how to move TMS to the next level this study was initiated by MoDOT management to determine with respect to TMS: What do we have? How are we using it? Is it helping us? What could we do better?

The study is based on a multi-level sampling approach (of 57 individuals throughout MoDOT management and TMS users) to determine the current status, strengths and weaknesses of MoDOT's existing Transportation Management System and provides an analysis of how this system serves MoDOT. A systems engineering analysis is conducted to determine disparities between MoDOT current practices, other DOT state-of-the-art practices, and MoDOT's desired decision support capability. Better and more informed decision-making should be possible as a result of this fundamental assessment of MoDOT's management systems.

Results

Objective #1 - *What does TMS currently have?*

TMS currently has three primary components: data inventory, report generation capability, and data analysis capability. These components are embedded within six system modules: Pavement Management System, Bridge Management System, Traffic Management System, Safety Management System, Travelways, and State-of-the-System.
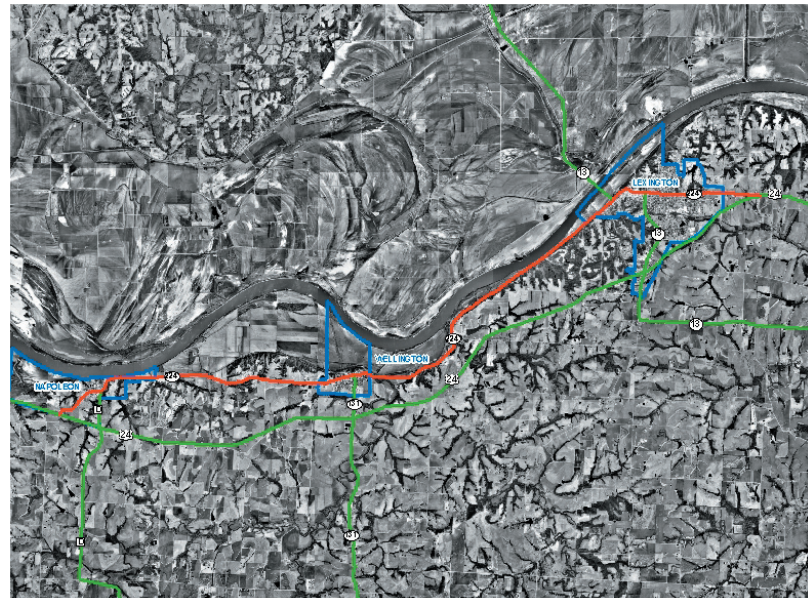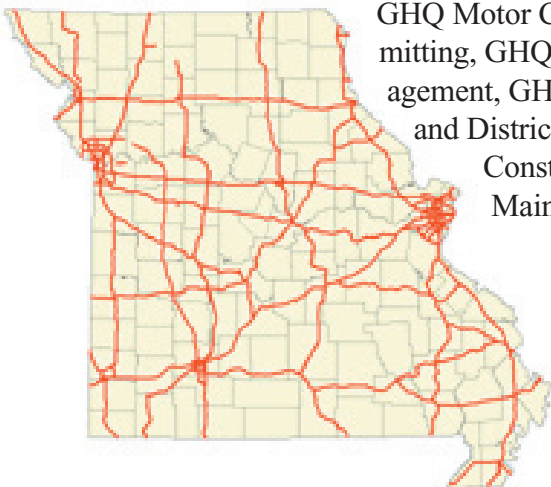
Objective #2 - *How is TMS being used?*

The interview responses were summarized with respect to:

- Overall Use – the degree to which TMS is used to support job decisions.
- Data Confidence – user confidence in data accuracy to support job responsibilities.
- Data Availability – the availability within TMS of data needed to support job responsibilities.
- Desired Applications – the degree to which TMS contains applications necessary to perform job responsibilities.
- Ease of Interaction – user experience when interacting with TMS.

Of these, "Overall Use" provides the most insight into how effective TMS is being used to supporting various decision making needs:

- High use was found in – GHQ Planning, GHQ Traffic/Safety, GHQ Adopt-A-Highway, District Planning, and District Operations/Traffic.
- Medium use was found in – GHQ Design Bridge / Inspection, GHQ Right of Way, GHQ Research, and District Management.
- Low or no use was found in – GHQ Project Development Management, GHQ Design, GHQ Operations Management, GHQ Maintenance, GHQ Motor Carrier Permitting, GHQ Risk Management, GHQ Legal and District Design, Construction and Maintenance.

It must be stressed that sometimes interviewees had perceptions of either the data or applications in TMS that did not match with the current state of TMS implementation. However, this fact does not diminish the significance of the findings of this study. All user and management perceptions, whether accurate or not, impact the overall effectiveness of TMS to support TMS decision making and need to be addressed.

Therefore, there is a two-fold answer to the question of "How TMS is being used?" First, it is only being used by a subset of those who should find value in TMS. Second, of those that do use TMS it is primarily used as a data warehouse to support the generation of reports relevant to overall analysis of the MoDOT transportation network (i.e. planning functions and some operations functions) versus more detailed analysis (i.e. design).

Conclusions

Objective #3 - *Is TMS helping make better decisions?*

Some functional areas are using TMS extensively and as a result have improved decision making ability: GHQ Planning, GHQ Traffic, GHQ Adopt-A-Highway, District Planning, and District Operations/Traffic. Some functional areas are using TMS little, if at all – GHQ Design, GHQ Maintenance, GHQ Risk Management, and District Design. Are better decisions being made? In general, it was found that the closer you get to a decision maker (i.e. GHQ management or Districts) the less data from TMS is being used to support decisions and hence it is not helping to make better decisions. The factors that lead to this conclusion are presented in the following.

1) The scope and objectives of TMS have fallen victim to "mission creep." TMS's focus is not well defined.
2) There is a "cry" from the users to "GET THE DATA CORRECT." Overall confidence in TMS is undermined by both actual and perceived data accuracy and data availability.
3) The system appears to be more tied to what was (ex. "data is the same as before"), than to what could be with respect to data contents and capability (ex. GIS/GPS, Web-applications, etc.)
4) The continuous log mile system is not working and is a source of data errors.
5) While the TMS is incrementally getting better, it still does not serve the users inside of MoDOT sufficiently and doesn't serve at all those outside of MoDOT.
6) The ownership of TMS must be resolved. Is data going to be a MoDOT corporate asset?
7) There is a need for both education on what TMS can currently do for individuals throughout MoDOT and training on how to use current TMS capabilities for TMS Users.

Overall, TMS is not supporting decision making to the extent that it is capable. Currently, TMS is primarily a data warehouse that needs to be refined and refurbished. Once the basic system issues are addressed, then decision support tools can be incorporated that allow for forecasting, what-if analysis, etc. Only then will the data be able to empower decision makers to use decision tools that support making decisions that can be measured and validated.

Recommendations

Objective #4 - *How could TMS be improved?*

The following recommendations are based on the data collected during this research, as well as a review of past documentation related to TMS and best management information system practices. This analysis was conducted at a high-level due to the short study time frame and some of the recommendations might warrant a more detailed-level, intensive analysis. However, regardless of the level of analysis there are several issues that stand out and need to be addressed.
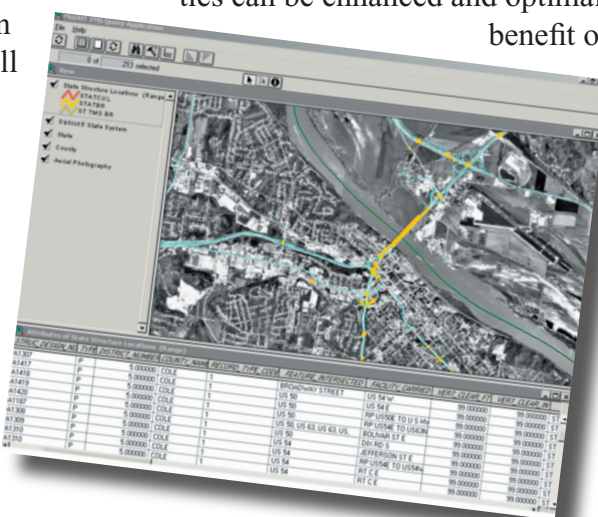
Immediate Needs
1) The focus, scope, and objectives of TMS need to be re-evaluated and clearly defined.
2) Several issues related to data quality (i.e. continuous log mile) and availability (i.e. outer roads) must be resolved.
3) A process for maintaining the data and its quality must be determined.
4) Market current TMS capabilities within MoDOT.
5) Communication of TMS related information to users needs to be enhanced.
6) Responsibility for TMS must be resolved so that TMS data needs and applications are determined by TMS users from all MoDOT functions.

Needs to be Addressed in the Near Future
1) A more user-friendly interface for TMS needs to be put in place.
2) The location referencing system (LRS) needs to move to GPS.
3) Increase and improve the training for TMS.
4) Make TMS Web-enabled.
5) Add decision systems support to TMS.
6) Data in TMS needs to allow for better and easier integration and cross-functional analysis.

TMS has evolved into an excellent tool that is often misunderstood and underused. Currently, TMS does lack certain functions that would make it a better tool and these are addressed in the above recommendations. All of these recommendations will require organization commitment to change and most will require hard work, but they are all achievable. The MoDOT TMS is based on an excellent foundation and has an excellent support team. It now must be decided if and how to move TMS to the next level so that its capabilities can be enhanced and optimally utilized for the benefit of MoDOT and the citizens of Missouri.

For more information contact:

James S. Noble, Ph.D., P.E.
Associate Professor
E3437J Engr. Bldg. East
University of Missouri-Columbia
Columbia, MO 65211
Phone: (573) 882-9561
FAX: (573) 882-2693
E-mail: *noblej@missouri.edu*

Cerry M. Klein, Ph.D.
Professor
Chairman, Director of Undergraduate Studies
E34371 Engr. Bldg. East
University of Missouri-Columbia
Columbia, MO 65211
Phone: (573) 882-9566
E-mail: *kleinc@missouri.edu*

Charles J. Nemmers, P.E.
Director
Transportation Infrastructure Center
E2506 Engr. Bldg. East
University of Missouri-Columbia
Columbia, MO 65211
Phone: (573) 882-0071
E-mail: *NemmersC@missouri.*

Melissa Anderson
Senior Research & Development Assistant
MoDOT
P.O. Box 270
Jefferson City, MO 65102
Phone: (573) 522-9296
E-mail: *Anderm2@mail.modot.state.mo.us*